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### SHIELDING DEVICE FOR CONNECTION STRIPS IN TELECOMMUNICATIONS AND DATA ENGINEERING

#### FIELD OF THE INVENTION

The invention relates to a shielding device for connection strips in telecommunications and data engineering, comprising a number of shielding plates and at least one base rail allocated to the latter.

#### BACKGROUND OF THE INVENTION

A shielding device of the generic type is already known from the connection strip disclosed in US 5,160,273. Here, the problem of crosstalk between adjacent

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insulation-piercing terminal contact elements of the connection strip is solved by the insertion of a multiplicity of electrically conductive shielding plates between the individual pairs of insulation-piercing terminal contact elements. The problem of crosstalk occurs when transmitting large volumes of information via electrical lines, the information being transmitted at high frequencies. Transmitting at high frequencies produces radiation and interference between adjacent lines, particularly when these lines are arranged close beside one another in the connection strip. Electrically conductive shielding plates are inserted between a pair of insulation-piercing terminal contact elements, the spacing between two adjacent pairs of insulation-piercing terminal contact elements being larger than the spacing between adjacent insulation-piercing terminal contact elements in a pair. The shielding plates are in this case inserted between pairs of insulation-piercing terminal contact elements in slots which extend transversely to the longitudinal direction of the plastic body of the connection strip, and contact the base rail situated in the longitudinal direction inside the plastic body. A disadvantage of this is that, when fitting the component into the plastic body, it is first necessary to fit the base rail, which has contact tongues for contacting the individual shielding plates, and that it is subsequently necessary to push the individual shielding plates into the connection strip. Consequently, the complexity of assembly is relatively high in order to provide the connection strip with the shielding device for high transmission rates in telecommunications and data engineering.

## SUMMARY AND OBJECTS OF THE INVENTION

The invention is therefore based on the object of improving the shielding device of the generic type in order to simplify assembly.

To achieve this object, the invention provides for the shielding plates and the base rail  
5 to be integrally formed from a metal plate, and for each shielding plate to be connected to the base rail via a narrow web and arranged rotated through approximately  $90^\circ$  with respect to the base rail. The shielding device according to the invention thus forms an integral component which is made of metallic material and which, during assembly of a connection strip for telecommunications and data engineering, is inserted into the plastic housing of the connection  
10 strip with its base rail, and its shielding plates, which are integrally connected to the base rail, are guided into all the preformed slots inside the connection strip at the same time. This simplifies assembly considerably.

In a further embodiment of the invention, the spacings between the shielding plates on a base rail may be designed to be different from one another. This enables a shielding plate to  
15 be matched to different applications.

The invention also relates to a method of producing the shielding device wherein a number of shielding plates and a base rail supporting the latter, as well as webs connecting the shielding plates to the base rail, are integrally formed from a metal sheet. The shielding plates are subsequently rotated in the region of the webs through approximately  $90^\circ$  with respect to  
20 the base rail.

According to a further aspect of the invention, a connection strip is provided for

telecommunications and data engineering. The connection strip has insulation-piercing terminal contact elements arranged in a plastic housing, and shielding plates arranged between said insulation-piercing terminal contact elements. At least one ground rail is allocated to the shielding plates. The shielding plates and the base rail are integrally formed from a metal sheet.

5 Each shielding plate is connected to the base rail via a narrow web and is arranged rotated through 90° with respect to the base rail.

According to still another aspect of the invention, a process for using a shielding device comprising a base rail and shielding plates is provided wherein the shielding plates are integrally formed on the base rail and are rotated through 90° with respect to the base rail. The device

10 is used as a shielding inside a connection strip for high transmission rates in telecommunications and data engineering applications.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its uses,

15 reference is made to the accompanying drawings and descriptive matter in which a preferred embodiment of the invention is illustrated.

## BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 is a perspective illustration of the shielding device;

20 Figure 2 is a front view of the device of Figure 1;

Figure 3 is a plan view of the device of Figure 1;

Figure 4 is a plan view of a metal sheet having punched-out shielding plates and the base rail;

Figure 5 is a perspective illustration, corresponding to Figure 4, of a part of the shielding device having a folded base rail;

5 Figure 6 is a side view of a connection strip;

Figure 7 is a cross sectional view along the line A-A in Figure 6;

Figure 8 is a plan view of the connection strip shown in Figure 6; and

Figure 9 is a cross sectional view along the line B-B in Figure 8.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

10 Referring to the drawings in particular, in the exemplary embodiment, the shielding device 1 comprises seven flat, essentially U-shaped shielding plates 2, a base rail 3 and seven connection webs 4, which connect the individual shielding plates 2 to the base rail 3. The shielding device 1 is made of conductive metallic material and is integrally formed, in particular punched, with the shielding plates 2, the base rail 3, and the connection webs 4, from a metal  
15 sheet 28. The sheet metal 28 is particularly copper, copper alloys, steel or aluminum. The shielding plates 2 and the base rail 3 with the connection webs 4 are initially in the same plane as the metal sheet 28 (as shown in Figure 4). In a work step which follows the cutting-out process, the individual shielding plates 2 are rotated in the region of their 5 connection webs 4 through 90° with respect to the base rail 3. A hole 5 in the base rail 3 is associated with each  
20 shielding plate 2 close to the connection web 4, and this hole 5 is used for adjustment during

the 4 production process. The metal sheet 28 may also be a metalized plastic strip or the like.

In the view of how the shielding device 1 is processed, shown in Figure 4, the individual shielding plates 2 are of U-shaped design, a roughly rectangular shielding panel 6 adjoining the connection web 4 and being provided with two prong-like shielding forks 7 at the end remote from the connection web 4. These shielding forks 7 are stepped by means of a shoulder 8 which tapers the cross section so that they are matched to the internal cross section of the connection strip 11.

Figure 4 shows the metal sheet 28 with cut-out or punched-out shielding plates 2 of width B with a mean spacing X between one another and with the cut-out or punched-out base rail 3 with the holes 5 which are used for adjustment during production. The length of the metal sheet 28 corresponds to the number of shielding plates 2 of width B plus the cut gaps.

Figure 5 shows the shielding plates 2 which are rotated through  $90^\circ$  with respect to the base rail 3 and are normally at a distance X from one another. To achieve a shorter distance X', a fold 9 is introduced into the base rail 3, as shown in Figure 8.

The shielding device 1 is used for shielding the individual insulation-piercing terminal contact elements 10 inside a connection strip 11 for high transmission rates in telecommunications and data engineering. Such a connection strip 11, having a plurality of insulation-piercing terminal contact elements 10 arranged in pairs, is illustrated and described in more detail in DE 43 25 952 C2 (and in US 5,494,461). US 5,494,461 is hereby incorporated by reference. The connection strip 11 is illustrated in Figures 6 to 9 and is described in more detail below with respect to the shielding device 1 used.

The connection strip 11 comprises a plastic housing 12 made of an upper part 13 and a lower part 14 which are latched to one another by means of latching openings 15 in the upper part 13 and latching lugs 16 in the lower part 14. Terminal slots 17 are formed in the upper part 13 and have integrally formed terminal lugs 18 and terminal webs 19 which serve to hold the insulation-piercing terminal contact elements 10. The latter are formed from sheet-like flat material and comprise two contact webs 21 enclosing a contact slot 20 between them. A base web 22 is adjoined by contact fingers 23 which merge into spring contacts 24. Two pairs of insulation-piercing terminal contact elements 10 are respectively arranged close beside one another, the spacing D between two adjacent pairs of insulation-piercing terminal contact elements 10 being considerably larger than the spacing d between insulation-piercing terminal contact elements 10 which are close beside one another, as can be seen in Figure 6. The individual shielding plates 2 of the shielding device 1 are inserted into the total of seven wider cross-sectional regions 25 of the connection strip 11, as shown by dashed lines in Figures 6 and 7 and by solid lines in Figures 8 and 9.

To insert the base rail 3 with the individual shielding plates 2 into the housing 12 of the connection strip 11, the upper part 13 in the exemplary embodiment contains seven chambers 26 with respective transverse slots 27 into which the individual shielding plates 2 are pushed. The base rail 3 is situated in a longitudinal slot 21 in the bottom region of the lower part 14, as shown in Figures 7 and 9. The shielding panels 6 and shielding forks 7, which adjoin the latter, of the individual shielding plates 2 essentially take up the whole of the cross section of the interior of the connection strip 11, as shown in Figure 9 in particular, and thus separate the

individual pairs of insulation-piercing terminal contact elements 10 in such a manner that greater  
5 crosstalk attenuation is achieved for high transmission rates as a result of the electrically  
conductive shielding plates 2. The use of the large-area electrically conductive shielding plates  
2 in the connection strip 11 does not require the physical volume of the connection strip to be  
5 enlarged, nor any greater expense to produce it.

The shielding device 1 does not require any grounding. It is important only that the  
individual shielding plates 2 are conductively connected to one another. This is achieved by  
means of the base rail 3, which is common to all the shielding plates 2. The shielding plates 2  
influence the electrical field in such a way that the influence charging of an insulation-piercing  
10 terminal contact element 10 is reduced in the adjacent insulation-piercing terminal contact  
element 10, and the interference voltage is thus small. This produces a relatively high signal-to-  
noise ratio. The signal-to-noise ratio becomes higher, with the result that higher frequencies  
can be transmitted without the adjacent lines of the insulation-piercing terminal contact  
elements 10 having an adverse effect on one another.

15 The number of shielding plates 2 in a shielding device 1 depends on the number of pairs  
of insulation-piercing terminal contact elements 10. In the exemplary embodiment, an 8-pair  
module is illustrated, which has seven chambers 26 for a total of seven shielding plates 2.  
Common pairings are 4/3, 8/7, 10/9, 12/11, 16/15, 20/19, 24/23 and 25/24, where the number  
of pairs of insulation-piercing terminal contact elements 10 and the number of shielding plates  
20 2 are indicated in each case.

For a HIGHBAND® brand 8 connection strip 11, the standard spacing X between the



shielding plates 2 is  $X = 12.6$  mm. However, for a Highband® brand 10 connection strip 11, for example, the spacing is  $X' = 9.6$  mm. For this, the folds 9 are introduced into the base rail 3 between each of the individual shielding plates 2. This spacing cannot be achieved by directly punching the shielding device 1 out of a metal sheet 28, since the width B of the individual shielding plate 2 needs to be around 12 mm on account of the width of the connection strip 11. Hence, for a Highband® brand 8 connection strip 11, the dimensions width  $B = 12.6$  mm and spacing  $X = 12.6$  mm complement one another well. For a narrower spacing  $X'$ , however, folds 9 are necessary; these may be replaced by any other kind of means for shortening the length of the base rail 3.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles of the invention, it will be understood that the invention may be embodied otherwise without departing from such principles.